May 23, 1967 J. H. MURRAY 3,320,720

PACKAGING APPARATUS

Filed April 20, 1964 6 Sheets-Sheet 1

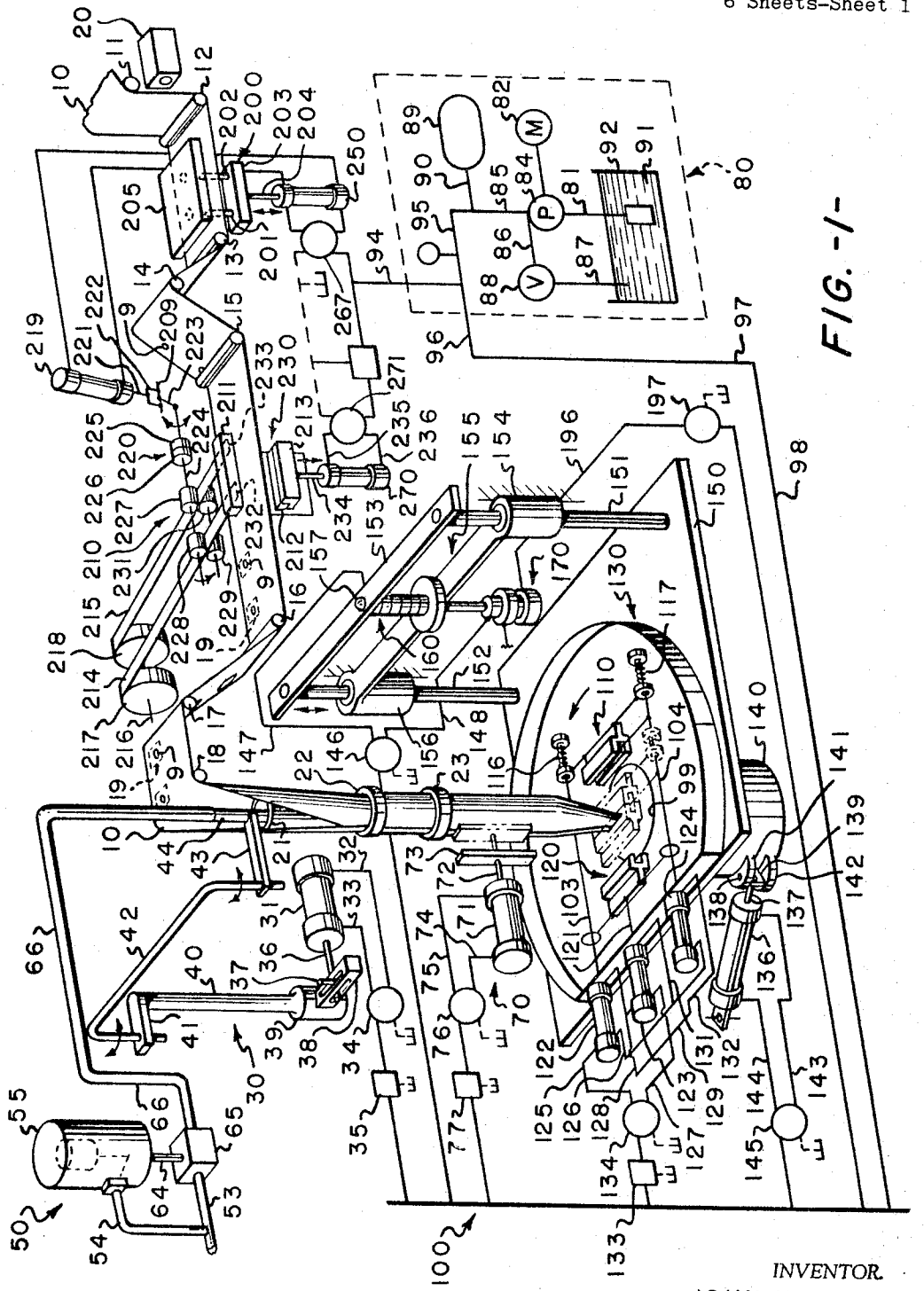


FIG. -1-

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May 23, 1967 J. H. MURRAY 3,320,720

PACKAGING APPARATUS

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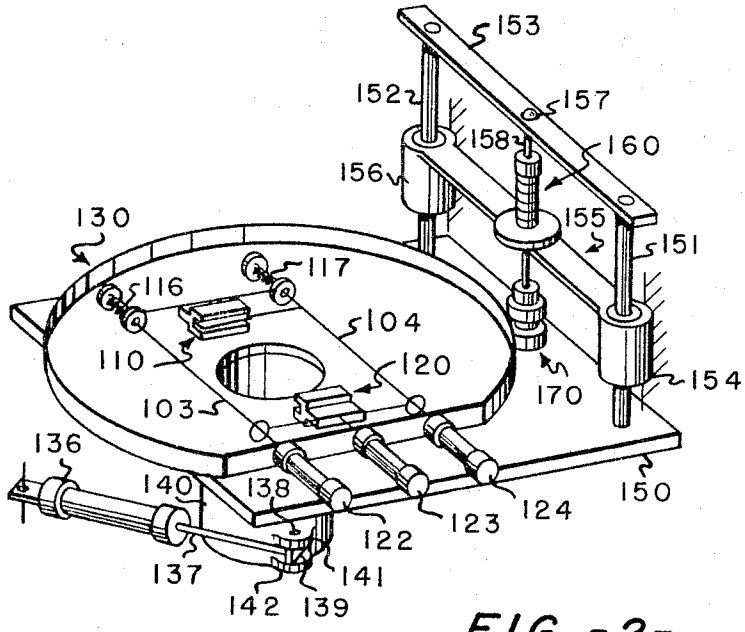


FIG. -2-

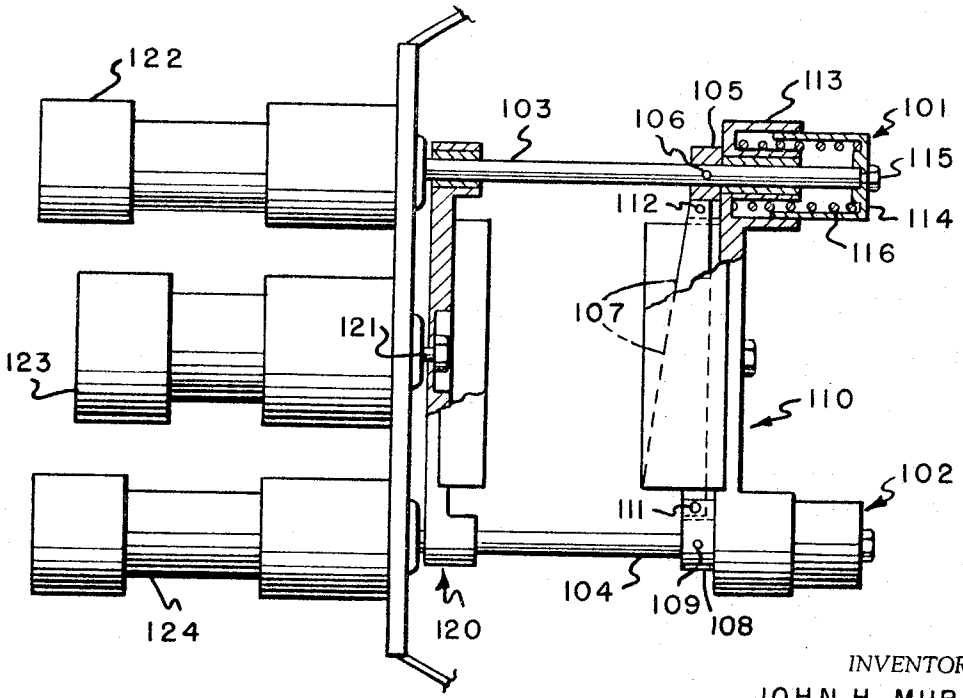


FIG. -3-

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May 23, 1967 J. H. MURRAY 3,320,720

PACKAGING APPARATUS

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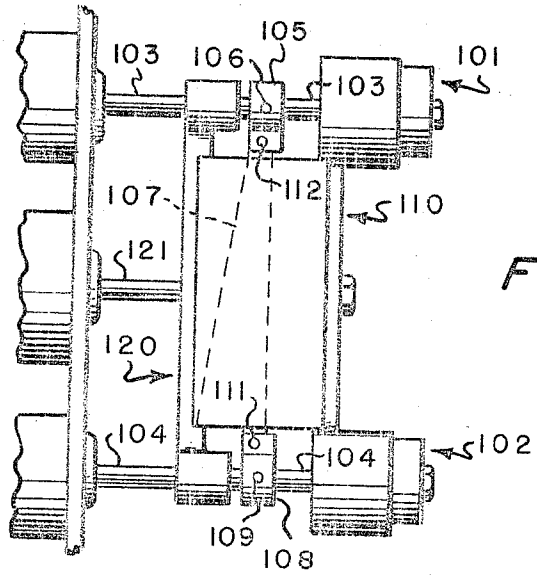


FIG. -4-

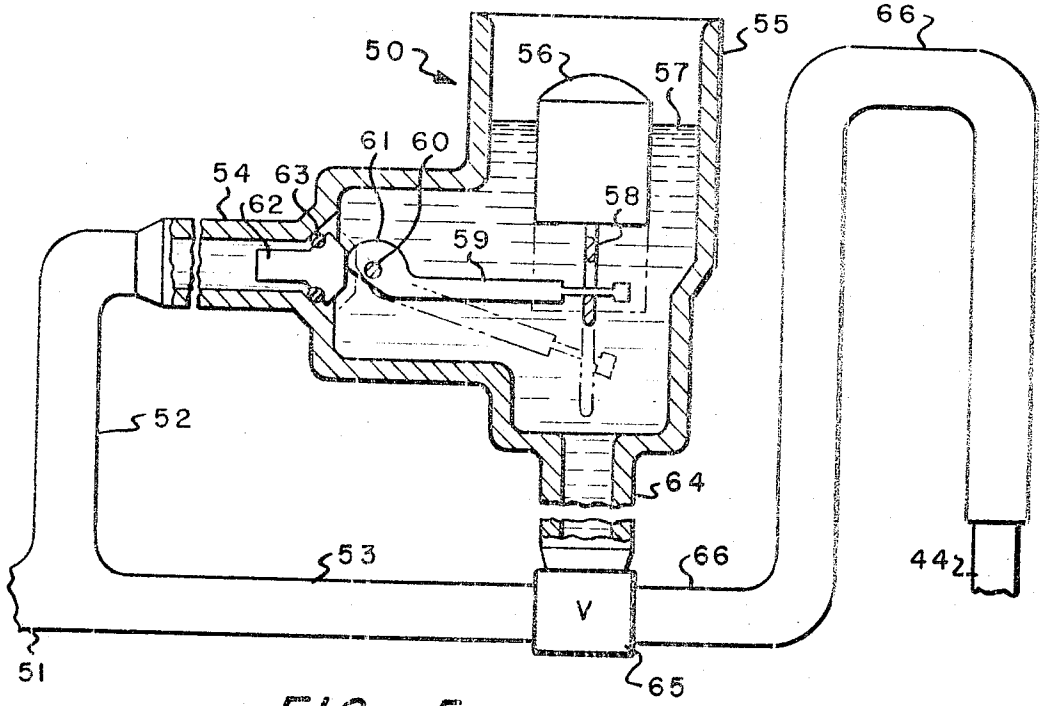


FIG. -5-

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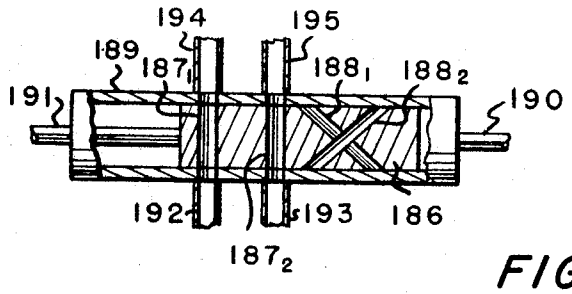


FIG.-9-

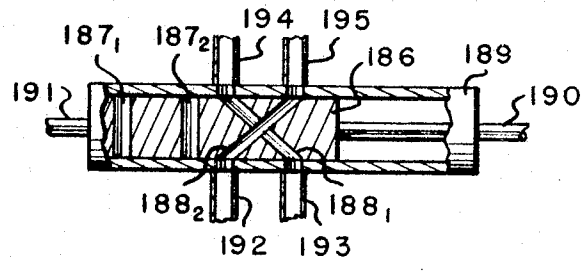


FIG.-10-

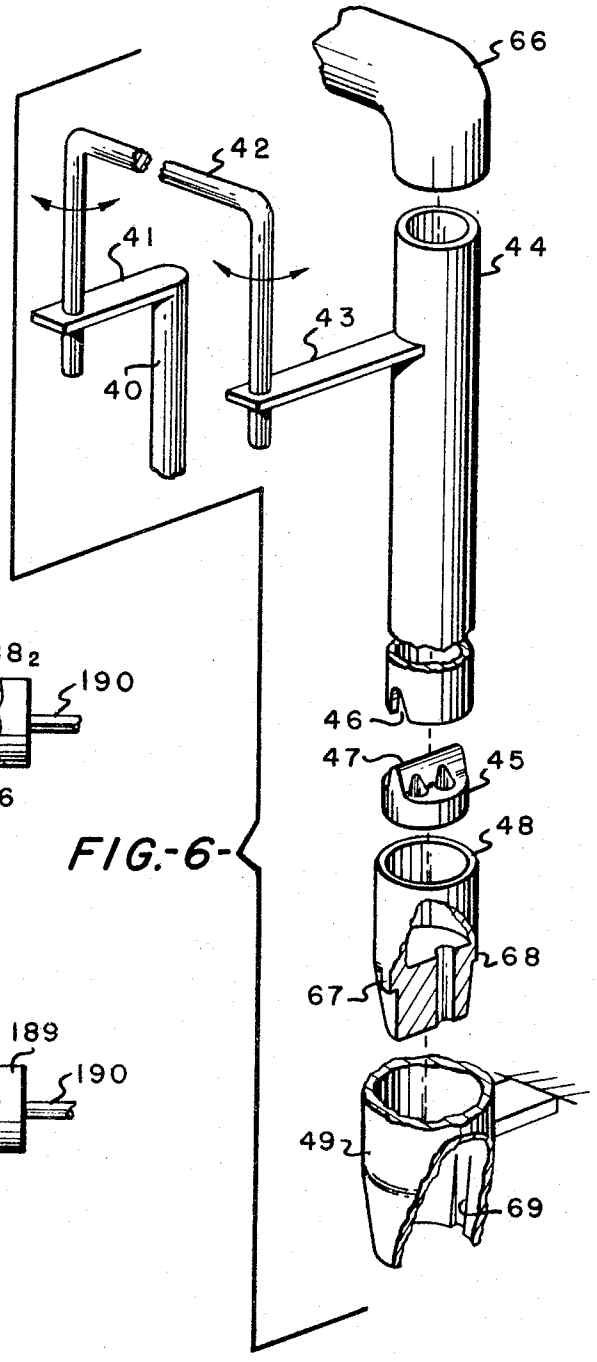


FIG.-6-

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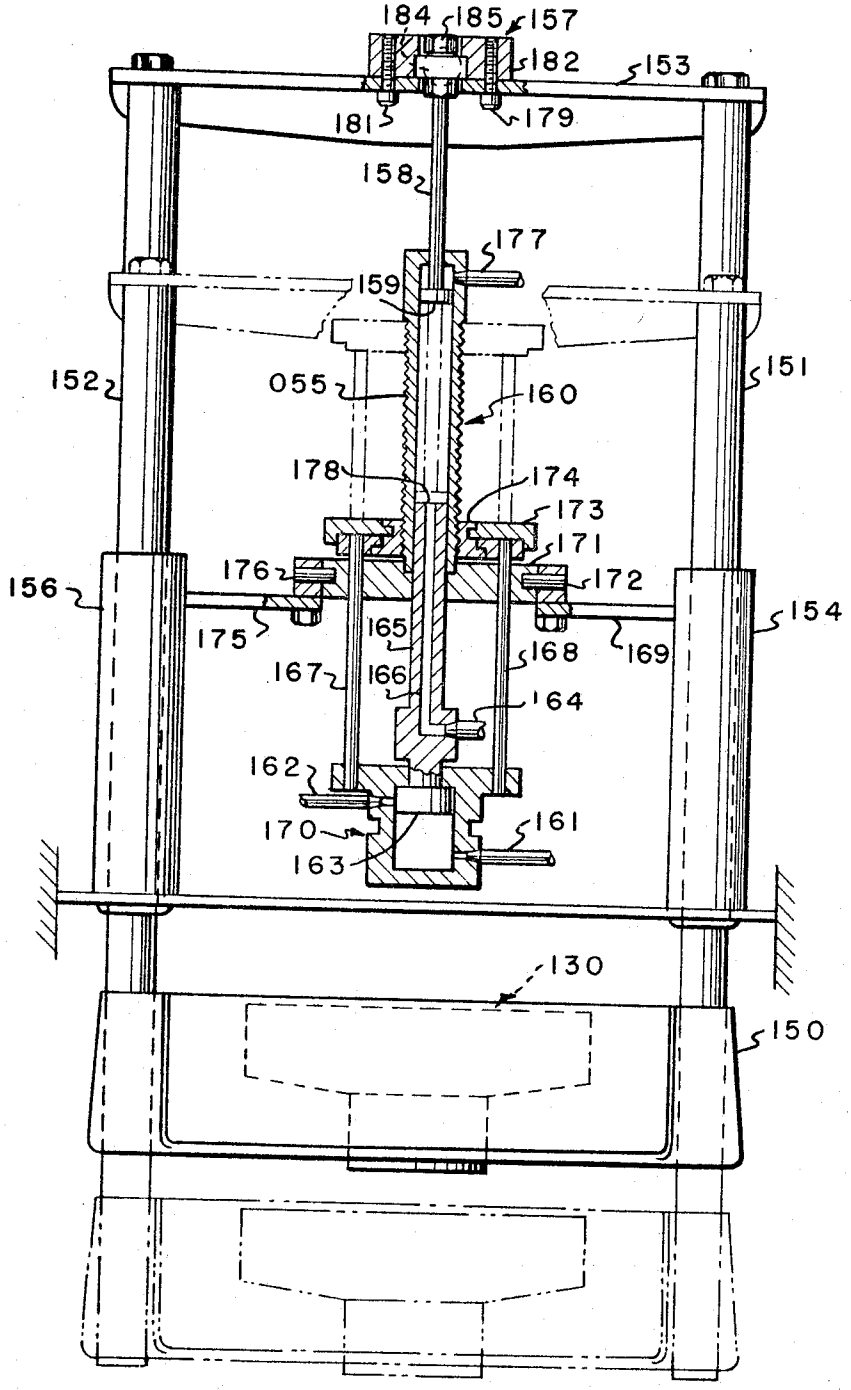


FIG. -7-

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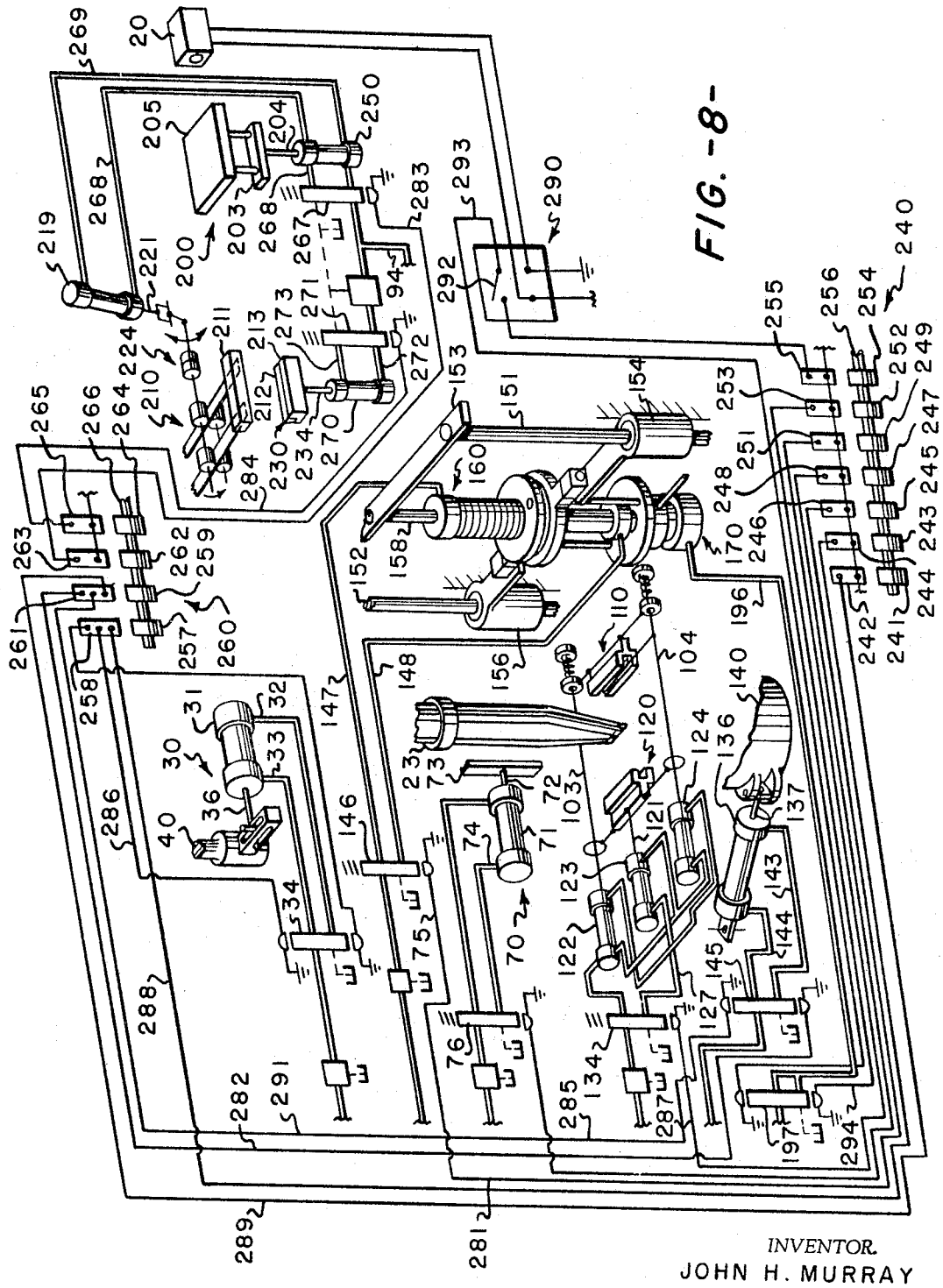
ATTORNEY

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PACKAGING APPARATUS

Filed April 20, 1964 6 Sheets-Sheet 6

FIG. -8-



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3,320,720

PACKAGING APPARATUS

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Filed Apr. 20, 1964, Ser. No. 361,137
5 Claims. (Cl. 53—182)

The instant invention is concerned with improvements in packaging machinery. In particular, it relates to improved machines for forming packages from a flat flexible web and a fluent substance introduced into the machine for packaging.

Packaging machines of such general character are known to the art. In such machines, a continuous flat flexible web from a supply roll is passed downwardly through appropriate guides and tube forming means which turn the lateral edges of the web inwardly for contact, and generally for overlap of one edge with the other. The contacting edges, generally coated with a thermoplastic heat flowable material are thus brought together and longitudinally heat sealed. The so-formed tubular shape is guided upon and is enclosed about a vertically disposed tubular filling mandrel for supplying the liquid which is to be contained within the final packages.

Below the filling mandrel the tube is transversely sealed in a first plane to form a tube with an enclosed lower end, i.e, a tubular blank, which blank is supplied with the liquid to be packaged. As the tube moves further downwardly an upper portion of the liquid filled tubular blank is closed, sealed and severed from the tube in a transverse plane above the first transversely applied seal so as to provide a liquid filled package. Where the transverse seals are applied at right angles one to the other a tetrahedron shaped liquid filled package results. On the other hand, where the transverse seals are applied in the same plane one with the other "pillow shaped" liquid filled packages are produced.

In general, such machinery for packaging liquids have met with considerable success, and are used commercially. Neverthless, however, there are numerous difficulties associated with the use of such machines and not the least of these difficulties is associated with their general complexity. Typical machines of this type necessitate the use of several pairs of sealing jaws carried on several endless chains which contact, seal and draw downwardly the liquid sealed tubular blank to form same into liquid filled packages. Such machines are very bulky and, inter alia, require considerable maintenance and operating labor. Even where sealing jaws are mounted on vertically reciprocable carriages the machines, inter alia, are powered by complex mechanical systems and are fraught with many of the aforesaid difficulties, and more.

Other difficulties associated with the use of prior art apparatus relate to the complexity of liquid metering systems. Aside from this difficulty however is that most such filling mechanisms overfill the packages to be formed so that the seal area of the package is contaminated, inter alia, by the necessity of having to seal the final packages through the material to be packaged. This increases the number of packages which leak or eventually form leaks upon handling. Also, product quality can be impaired to some extent.

Aonther disadvantage of prior art apparatus is that relating to proper web registration and control. Many packaging machines are not capable of providing such registration and control or the mechanisms employed do not function to the extent of the accuracy and dependability desired.

Because of these and other shortcomings it is a primary object of this invention to provide machines of the general character described but which embody novel and improved features, particularly as relates to the powering and timing of the several operating functions of the machine. A particular object is to provide improved machines which include the novel features of a combination arrangement including the various web feeding, tube forming, sealing and liquid packaging functions above mentioned. It is also an object to provide an improved combination including a tab seal package forming assembly and web registration device which applies corrections to the various machine movements and functions to maintain proper registration and alignment of the web in accordance with any desired indicia marked thereupon. Also it is an object to provide an improved combination of features wherein the operating functions of the machine are actuated by appropriately timed hydraulically responsive operational units.

These and other objects are accomplished in accordance with the present invention which contemplates in combination a packaging machine of the type described and a hydraulic power supply for providing on demand hydraulic fluid in desired quantities at operating pressures to a line or manifold provided with individual valves operated in timed sequence for directing the fluid to the several operating functions of the machine. At each station wherein an operation is to be performed upon the flexible web to contribute to its final formation into a package filled with a fluent substance there is provided cylinder-piston units, i.e., hydraulic motors, to convert fluid power into mechanical power for actuation of the operating functions. These cylinder-piston units are directed and controlled by signals from a timer which causes the opening and closing of the valves to activate the proper cylinder-piston unit in predetermined sequence.

The present invention will be better understood by reference to the attached drawings and to the detailed description given hereinafter which makes specific reference to the drawings. In the drawings wherein similar reference numerals refer to generally similar or identical parts:

FIGURE 1 is a schematic overall view of the various components, sub-components, combinations and subcombinations of the new and novel liquid packaging machine showing the relationship of one assembly to another, including in particular, a hydraulic power supply which is manifolded through directional flow control valves to the various cylinder-piston units or fluid actuatable motors which provide the various operating features of the machine;

FIGURE 2 shows a hydraulically vertically reciprocable carriage which carries with it a rotatable platform upon which is mounted a pair of hydraulically actuatable clamping jaws for grasping and for advancement of the web, and for transverse sealing and severing of a formed packaging from the tublar body, this being generally similar to that embodiment shown as a portion of FIGURE 1 except that the platform is rotated 90° from the view shown in that figure;

FIGURES 3 and 4 provide a detailed showing of the transverse sealing and tube severing mechanism, the former showing the sealing jaws in open position and the latter showing the jaws closed as to effect sealing and severance of a package from the tube, which also is the jaw position for grasping the tube to move same through the apparatus;

FIGURES 5 and 6 show the liquid metering apparatus for providing measured quantities of the fluent substance to be packaged to the tubular blank, FIGURE 5 showing specifically apparatus for providing a ready source of the fluent substance at substantially constant pressure and FIGURE 6 time control mechanism for delivering the desired quantum of fluid to be packaged;

FIGURE 7 illustrates in detail mechanism by means of which the carriage, and consequently the transverse sealing mechanism, is actuated, and shows also the features of a web registration correction cylinder or package length control device;

FIGURE 8 illustrates electrical timing and control mechanism for providing the several sequences of apparatus functions for package formation, and also a timing and control circuit to provide proper web registration; and

FIGURES 9 and 10 are schematic representations of a push-pull or spool type four-way valve which appears so frequently as a solenoid actuated four-way control valve used in the presently described apparatus.

As the following detailed description unfolds, particular attention is directed to FIGURE 1 wherein a more rapid understanding can be gained by relating the descriptions in all subsequent figures back to that first figure.

Referring to FIGURE 1 generally is shown a flat flexible web **10** which is drawn from a supply roll (not shown) and advanced over the several guide rolls **11** through **18**, and thence downwardly about and between the mandrel **21** and forming rings **22**, **23** to shape the web in tubular form. The web **10** is thermoplastic coated on its upper side, and at a lower portion when formed into a tube is sealed along its longitudinal edges by application of member **73** of longitudinal sealing unit **70** upon the overlapping edges to heat seal these edges together. The open tube is transversely sealed at its bottom by closure upon the tube of the pair of clamping jaws **110**, **120** to form an open end vessel or tubular blank. The tubular blank is filled with a metered quantity of a liquid to be packaged therein, the liquid being charged from filling chamber **55** of liquid metering system **50** into the blank via a valved fill tube **44** which extends vertically downwardly within the confines of the forming mandrel **21** and into the tubular blank.

In forming liquid filled packages the tubular blank is progressively drawn downwardly by the descent of vertically reciprocable carriage **150** which carries with it the pair of heated movable jaws **110**, **120** which closes upon and grasps the tube at the peak of the upward movement of carriage **150**, and releases same at the lowermost position of downward movement. The carriage **150** and jaws **110**, **120** then move upwardly while the tube remains motionless in its downwardly displaced position. The newly formed blank is filled with liquid. The jaws **110**, **120** at the peak of the upstroke of carriage **150** are again closed on the tube at a location above the level of the liquid which is, of course, above the seal previously applied. The liquid filled closed tube segment is then severed through the upper seal to form a closed liquid filled package and then both package and tube, which remain in fixed relative position one to the other, are again drawn downwardly while heat sealing of tube and package continues. At the bottom of the working stroke or downstroke of carriage **150** the grasp of the jaws **110**, **120** upon the tube and package is then released and carriage **150** returns to its upward position in resuming the cycle. By this action of carriage **150**, the web **10** is drawn in intermittent movements through the packaging apparatus and liquid filled packages are continuously formed and ejected from the apparatus.

In its passage through the packaging apparatus web **10** then has a series of operations performed thereon, these operations taking place in timed sequence at several operating stations. These operations for package formation also include, preferably, the formation of straw seal openings or pull tab units **19**. These tab seal units **19** are small openings **9** formed within the web **10**, which openings are covered and sealed closed by tabs placed thereover. These units **19** can even be formed, if desirable, so that the seals can be easily punctured as by passage therethrough of a soda straw for immersion and withdrawal of the liquid contents from the package. In accordance with the present apparatus a pair of holes **9** are punched in web **10** at the punch station **200** and each of the holes are covered by a tab applied at station **230**. A pair of tab seals **19** are so spaced that each will be separated one from the other and will form a component part of an individual liquid filled package.

These series of actions having been described in general terms shall now be described in greater detail and in a sequence described first by tracing a given segment of web **10** as it first enters the machine. Attention therefore is initially directed to the top right side of FIGURE 1 wherein a tensioned flat web **10** from a supply roll (not shown) enters the apparatus.

The web **10**, maintained under constant tension by means not shown, is first advanced via rollers **11**, **12** through a path across the photoelectric eye **20**, the function of which shall be later explained in detail, thence through hydraulically actuated punch assembly **200** which perforates the web **10** with a pair of holes **9** so spaced that each will appear individually within a finished liquid filled carton. In the perforation step the web **10** lies motionless and punch members **201**, **202** mounted on the punch plate **203** are projected and passed through the web **10** upon activation of the hydraulic cylinder-piston unit **250**. Thus, it will be noted that punch plate **203** is intregally mounted upon piston rod **204** of cylinder-piston assembly **250**, and is thrust vertically upward by projection of piston rod **204**. In such action the terminal ends of the members **201**, **202** pass through the web **10** and into a pair of dies or female members (shown by dotted lines) within punch die **205**. The punch members **201**, **202** are then withdrawn also while the web **10** is motionless by the reverse movement of punch **203** in timed response to activation of the cylinder-piston unit **250** in the opposite direction, this withdrawing rod **204** back into the cylinder-piston unit **250**.

Completion of the tab seal units **19** is accomplished by covering the individual perforations made in the web **10** with tabs, this being accomplished specifically by action of tab seal cover assembly which includes really a tab advancing mechanism **210** and a tab cutting and sealing mechanism **230**. Thus, web **10** is next advanced via rollers **13**, **14**, **15** between the hydraulically actuated tab seal assembly plate **211** and a blade edge **212** mounted upon member **213**. Between these members and between the web **10** and member **213** has been placed the ends of a pair of thermoplastic coated tapes **214**, **215** advanced by tab advancing mechanism **210**. The manner in which this is accomplished and the actual formation of the tab seals **19** are next explained in some detail.

Simultaneously with the activation of hydraulic cylinder-piston unit **250** to project rod **204** for punching holes **9** it will be observed that hydraulic cylinder-piston unit **219** is also activated and its rod **221** is also thrust outwardly. In such activation tapes **214**, **215** are withdrawn from rolls **217**, **218** mounted on axle **216**, and advanced a predetermined amount. It will thus be observed that piston rod **221** which is operatively connected to a one-way clutch assembly **220** via linkage with bifurcated member or yoke **222** and through pivotal member **209** with an L-shaped member having a lever arm **223** and an axle portion **224**. This mechanism translates a thrust of rod **221** into an angular force by rotation of arm **223** about axle **224** to produce rotation of disc **225** to which axle **224** is connected. This in turn causes a corresponding rotation of disc **226** which is free to turn only in this one direction. Rotation of disc **226** then causes a corresponding rotation of rolls **227**, **228**. It will be noted that tapes **214**, **215** pass between rolls **227**, **228** and back-up friction rolls **229**, **231** so that rotation of rolls **227**, **228** causes advancement of tapes **214**, **215** over each of a pair of holes **9**. It will also be noted that the terminal ends **232**, **233** of tapes **214**, **215** upon advancement lie beneath the web **10** and between member **211** and blade **212** on member **213** of tab seal assembly **230**.

Upon activation of hydraulic cylinder-piston unit **270** there is an outward thrust of piston rod **234** and blade **212** of member **213** which is integrally connected with rod **234**. The terminal ends of tapes **214**, **215** are severed by the "scissor action" resulting from projection of the cutting blade **212** across the edge of member **211**. Further, by the same movement the tabs **232**, **233** are thrust against web **10** and heat sealed over holes **9**. The heat sealing is accomplished by pressure and heating of the tabs **232**, **233** between the flat faces of members **211**, **213**. Generally a small unsealed portion of the applied tab is left extending from the sealed portion to form a pull tab.

In the formation of the tab seal openings **19**, which always occurs when web **10** lies motionless, activation of cylinder-piston units **219**, **250**, as noted, occur in unison and pistons **204**, **221** are thrust outwardly. They are also withdrawn simultaneously. The action is just the alternate of that of cylinder-piston unit **270**. Holes are punched by punch assembly **200** and tapes **214**, **215** are simultaneously advanced while cutting member **212** is retracted. So, upon withdrawal of punching member **203** by reverse movement of rod **204**, the rod **221** of cylinder-piston unit **219** is also withdrawn and disc **225** of the one-way clutch assembly **220** is rotated in reverse direction, and through the action of the one-way clutch **224** tapes **214**, **215** are not withdrawn. And, simultaneously, when rods **204**, **219** of cylinder-piston units **250**, **219** are withdrawn rod **234** of cylinder-piston unit **270** is thrust outwardly to cut the tapes **214**, **215** forming tabs **232**, **233** to cover the holes **9** and complete the formation of the tab seal openings **19**.

The formation of the tab seals **19**, having been completed, web **10** is next advanced via rollers **16**, **17**, **18** outwardly and thence downwardly whereupon its formation into tubular shape begins. Thus, the flat flexible web **10** is now moved downwardly at right angles from its path of travel over roller **18** and the edges of web **10** are gradually turned toward each other and finally are overlapped and heat sealed together. Thus, web **10** is passed downwardly and gradually enclosed about the forming mandrel **21**. The tubular web **10** is passed through the annulus formed between mandrel **21** and forming rings **22**, **23**. The overlapping edges of the web **10** are then heat sealed one upon the other by application of heated member **73** which causes flow of the thermoplastic coating on the web **10**. It should be noted that member **73** is mounted upon piston rod **72** which is an integral part of hydraulic cylinder-piston unit **71**. Such longitudinal overlap seams are formed by intermittent applications of member **73** which is reciprocated in response to activation of hydraulic cylinder-piston unit **71**. It is obvious that an inside face-to-inside face seal can be also formed by the incorporation of seam forming apparatus well known to the art.

A tubular blank fit for reception of liquid is now formed from the longitudinally sealed tubular shaped web **10** by application of a lateral or transverse seal to close the bottom of the tube. A transverse seal is thus formed by the clamping action upon the tube of the pair of heat sealing jaws **110**, **120** which are integrally mounted within the rotatable platform **130** which likewise is an integral portion of reciprocable carriage **150**. Upon initiation of a transverse seal by the grasp of heated jaws **110**, **120** at the peak of the upstroke of carriage **150** a liquid filled package is severed from the tube and tube and web **10** are then drawn downwardly while the sealing of the package and tube is conducted. At the bottom of the downstroke of carriage **150** the grasp of jaws **110**, **120** upon the tube is released. A liquid filled package is discharged from the apparatus via opening **99** to provide a liquid filled package, and a newly formed tubular blank is again in readiness for receiving or continued receiving of liquid.

The clamping jaws **110**, **120** and rotatable platform **130** form a portion of a transverse sealing assembly which is capable of forming packages of varying shapes from the tube, especially tetrahedron shaped packages. The precise manner in which this is accomplished shall now be described by continued reference to FIGURE 1 and also by reference to FIGURE 2.

It will be observed that carriage **150** is rigidly affixed in cantilever fashion upon an end of posts **151**, **152**. Posts **151**, **152** are slidable within stationary bearing members **154**, **156** of the rigidly affixed support structure **155**, and are directly affixed at their opposite ends by connection with yoke **153** which is operatively associated with cylinder-piston unit **160** via connection to piston rod **158** (FIGURE 2). It will be apparent that projection of piston rod **158** results in upward displacement of carriage **150** and conversely, when piston rod **158** is retracted into cylinder-piston unit **160** carriage **150** is moved downwardly; posts **151**, **152** sliding within the stationary bearing members **154**, **155**.

Rotatable platform **130**, mounted upon carriage **150**, and carrying clamping jaws **110**, **120** oscillates vertically with the carriage **150** in response to actuation of cylinder piston unit **160**. A feature of the transverse sealing assembly is that platform **130**, and consequently jaws **110**, **120** is rotatable within limits this permitting formation e.g. of tetrahedron shaped packages, as desired. Pillow shaped packages can also be formed but in such package formation platform **130** is not caused to rotate and jaws **110**, **120** are always applied in a common plane. Where tetrahedron shaped packages are desired jaws **110**, **120** however, are applied alternatively at 90° angles. Thus, the seals of each individual package are formed at right angles one to the other.

In forming a package of any shape jaws **110**, **120** grasp the liquid filled blank at the peak of the carriage upstroke, sever the package from the tube, pull tube and package downwardly and, at the lowermost portion of the carriage downstroke the grasp of the jaws **110**, **120** are released and the completed package is ejected as heretofore described. This condition is in fact clearly illustrated by reference specifically to FIGURE 1 wherein jaws **110**, **120** have just moved apart one from the other. In this condition of operation it is noted that piston rods **103**, **104** of cylinder-piston units **122**, **124** are projected outwardly and piston rod **121** of cylinder-piston unit **123** is retracted. Further, piston rod **137** of cylinder-piston unit **136** which is operatively associated with the movable platform **130** via pivotal connection to the lower portion of transverse sealing assembly **140** is fully retracted. Thus, it will be noted that piston rod **137** is connected with member **139** mounted between projections **141**, **142** by means of pin **138** passing therethrough and that movement of piston rod **137** will produce rotation of member **140** and consequently platform **130** which carries sealing jaws **110**, **120**. As carriage **130** begins to ascend then rotation of platform **130** is initiated by virtue of the projection of piston rod **137** of cylinder-piston unit **136**. The full ninety degree rotation which takes place on the upstroke is readily shown by reference to FIGURE 2 and particularly to the changing condition shown by comparison of FIGURES 1 and 2. In FIGURE 2 a condition is shown wherein the platform **130** has rotated through a full 90° angle and is representative of the moment just prior to closure of jaws **110**, **120**. Upon closure of jaws **110**, **120** the tube is drawn downwardly to complete the formation of the package. As will be apparent cylinder-piston unit **136** can be provided with a piston rod of different lengths so that upon completion of an upstroke the platform is rotated through any desired angle up to 90°.

The transverse sealing and package severence mechanism is described generally by continued reference to FIGURES 1 and 2. Thus, at the peak of the upstroke of carriage **130** jaws **110**, **120** close resiliently upon the

tube and heat seal transversely the web edges across a narrow band above the level of the liquid. As jaws **110**, **120** are pulled more tightly together by withdrawal of piston rods **103**, **104** into cylinder-piston units **122**, **124** respectively, and by continued projection of piston rod **121** of cylinder-piston unit **123** springs **116**, **117** are compressed to cause projection of blade which severs the filled package by its cutting action as it passes through the transverse seal and into the opposite jaw **120**.

This severing action is more precisely shown, however, by specific reference to FIGURES 3 and 4. A single blade **107** is mounted within jaw **110**, it being connected at one end to a block **105** by passage of pin **112** therethrough and to a second block **108** at its opposite end by means of pin **111**. The blocks **105**, **108** are, on the other hand, connected to piston rods **103**, **104** respectively, by pins **106**, **109**. It should be noted that blade **107** is mounted to blocks **105** and **108** directly in front of a pair of compressible springs, one of which is shown at **116**, which allows the piston rods **103** and **104** to cause the blade **107** to project out of the jaw **110** when the jaws **110** and **120** have come into heat sealing relationship. Thus, springs **116**, **117** (not shown) are mounted within compressible housing members **101**, **102** affixed directly to piston rods **103**, **104** of cylinder-piston units **122**, **124** and upon continued retraction of piston rods **103**, **104** springs **116**, **117** are compressed this permitting the rods to continue their movement, this in turn carrying forward blade **107**.

Both housings **101**, **102** are identical and the details of housing **101** are shown by specific reference to the half section portion of FIGURE 3. Thus, it will be noted that continued retraction of piston rod **103**, affixed via locking nut **115** to housing member **114** permits continued forward movement of the smaller cylindrical housing **114** into the confines of the outer cylindrical housing **113** of greater diameter while simultaneously spring **116** is compressed. As forward motion continues blade **107** is caused to project beyond the face of jaw **110** through the seal and into a recess provided therefor within jaw **120** which forcibly opposes the motion of jaw **110**. After severance the liquid filled package and the tube are held in fixed relative position and sealing is effected during the downstroke of carriage **150** until such time as the grasp of jaws **110**, **120** is released and the package ejected. In accordance with a preferred embodiment a more optimum period is provided for proper heat sealing by providing that jaws **110**, **120** and carriage **150** move more rapidly on the upstroke than on the downstroke since there is no heat sealing or other working condition to be performed on the upstroke.

The more precise manner in which the vertical movement of carriage **150** is accomplished and the precise driving means for achieving such function is best explained by specific reference to FIGURE 7. In this figure is also shown a portion of the mechanism by means of which web registration is accomplished.

Referring first generally to the figure, as discussed heretofore in connection with FIGURE 1, is shown an adjustable main cylinder-piston unit **160** operatively connected via its reciprocable piston rod **158** and gimbal **157** to yoke assembly **153** which is in turn affixed to posts **151**, **152** which supports carriage **150**. These latter members are thus directly affixed at one extremity to yoke **153** and to carriage **150** at their opposite extremities. It will be noted that posts **151**, **152** are slidable within stationary bearing members **154**, **156** and that carriage **150** and consequently rotatable platform **130** oscillate vertically as piston rod **158** moves back and forth within cylinder-piston unit **160**.

In the figure also will be noted a secondary cylinder-piston unit **170** which is a part of a photoelectric eye-web registration correction system which shall be later described in detail by reference to FIGURE 8, and again by reference to the present figure. For the present it suffices to say that the registration correction cylinder-piston unit **170** permits shortening of the amplitude of the carriage stroke so that the movement and positioning of the web can be automatically adjusted within permissible ranges for proper control of package length.

It will be noted that both the main cylinder-piston unit **160** and registration correction cylinder **170** are supported upon a trunnion **171** to which is affixed stationary bearings **154**, **156** within which moves posts **151**, **152** carrying reciprocable carriage **150**. It will be further noted that the bearings are affixed to the trunnion **171** by connection with supporting structure **169**, **175** upon which it is secured via pins **172**, **176**.

The main cylinder-piston unit **160** is constituted of an externally threaded cylindrical barrel **055** having an internal opening within the confines of which is slidably positioned piston rod **158**. At one terminal end of piston rod **158** is affixed a piston **159** the external diameter of which is substantially the same as the internal diameter of the opening within cylindrical barrel **055**. At the opposite end of piston rod **158** is affixed yoke **153** via connection through gimbal **157**. The gimbal **157** is really a ball socket arrangement to relieve pressures which might develop due to slight alignment problems in the structure. It will be noted that gimbal **157** consists of an open centered bearing housing **182** which is affixed to yoke **153** via bolts **179**, **181**. The end of rod **158** is held therein via its ball member **184** and by locking nut **185**.

As is apparent the length of the carriage stroke is determined by the inside linear dimension of cylinder barrel **055** which is the maximum distance over which piston **159** is free to travel. A carriage stroke is thus measured by the distance between the vertical drive cylinder head **178** and the opposite extremity of the cylinder barrel **055** dimensioned by the thickness of piston **159**. The linear dimension within which the piston is free to travel therefore determines the amplitude of the carriage stroke.

It will thus be seen that the upward motion of piston rod **158** is produced by flow of hydraulic fluid into the lower end of threaded cylinder barrel **055** via conduit **164** and channel **166** within vertical cylinder **165**. The piston rod **158** moves until the piston **159** "bottoms out" against the upper portion of the cylinder barrel **055**. In such upward projection of the piston rod **15** the fluid passing upwardly via conduit **164** fills the chamber of cylinder barrel **055** and exerts pressure against the piston **159** to lift carriage **150**. Concurrently with the upward movement of the piston rod **158** hydraulic fluid exits from cylinder barrel **055** via line **177**. Conversely, when the direction of movement of piston rod **158** is reversed and it is moved downwardly, to cause carriage **150** to descend, pressurized hydraulic fluid flows into the upper end of the cylinder barrel **055** via line **177** and out of cylinder barrel **055** via conduit **166** and hydraulic line **164**. This flow of hyydraulic fluid into and out of cylinder barrel **055** causing vertical reciprocation of carriage **150** is regulated by a four-way control valve activated in timed response to a signal.

Adjustment of the length of the carriage stroke is an important feature of this apparatus. One reason for adjustment of the carriage stroke is to change the lengths of the packages to be produced. The manner in which such adjustment is made is shown by continued reference to the figure. Cylindrical barrel **055** can thus be lengthened or shortened by raising or lowering vertical cylinder **165** into the cylinder barrel **055** to lengthen or shorten the opening therein. Rotation of hand wheel **173**, which rotates together with threaded collar **174**, raises hand wheel **173** itself upwardly carrying with it rods **167**, **168** which will elevate the entire registration correction cylinder **170** and cause upward projection of the vertical cylinder **165** into the cylinder barrel **055** to shorten its length. Thus, rotation of the hand wheel **173** with its threaded collar **174** about externally threaded vertical drive cylin-

der 055 will cause it to move upwardly carrying with it the entire registration correction cylinder 170 the latter moving upwardly with the movement of rods 167, 168 which are raised within trunnion 171 this causing projection of the terminal portion 178 of the vertical cylinder 165 into cylinder barrel 055. Rotation of hand wheel 173 in the opposite direction, to the converse, obviously lengthens the opening within cylinder barrel 055. This feature then permits setting the length of the carriage stroke and consequently the length of a package.

To provide proper web registration the carriage stroke can also be shortened as the occasion demands by upward projection of the vertical cylinder 165 in response to an appropriate correcting signal. Pursuant to this embodiment a signal from a primary sensing device, as from photoelectric eye 20, activates a three-way valve permitting pressurized flow of hydraulic fluid into line 161 in the chamber of correction cylinder 170 to act against piston head 163 to cause upward projection of vertical cylinder 165 into the path of piston 159 to effectively shorten the length of cylinder barrel 055. In this manner the carriage stroke is shortened and web 10 is moved downwardly to a lesser extent. After such correction has been made the three-way valve is activated in the opposite direction to permit discharge of hydraulic fluid from line 161. As the vertical cylinder 165 is moved downwardly by the force of piston 159 against terminal end 178 the vertical cylinder 165 is then forced back into its proper position and remains there until a new correction is desired. The purpose of this correction, as will be explained later, is to constantly apply a correction so that the package length will always be maintained within limits without drift from one extreme to another.

The package filling mechanism 30, 50 shall now be described in detail by reference particularly to FIGURES 5 and 6. Reference to these figures thus shows an intermediate supply chamber 55 in metering system 50 which provides a supply of liquid at constant pressure for charging portions from said chamber 55 in response to a signal timed in sequence and duration with reference to the overall cycle to activate fill tube 44 of valve control mechanism 30 to meter into the blank the correct amount of liquid at the proper time.

Prior to completion of an upstroke of carriage 150 the flow of liquid from the supply chamber 55, previously filled to a desired operating level is initiated.

Upon discharging the desired quantity of liquid from chamber 55 through line 64, valve 65, line 66 and fill tube 44, as will be observed by specific reference to FIGURE 5, float 56 moves downwardly as liquid level 57 falls. It will be readily observed that the downward movement of the float 56 pushes downwardly via action of arm 58 upon linking arm 59. It will also be observed that the linking arm 59 is pivotally connected via pin 60 to a wall (not shown) of chamber 55. The arm 59 is provided with a cammed surface 61 a portion of which rests against plug 62. Downward rotation of the arm 59 moves cammed surface 61 horizontally away from plug 62. Such movement lessens the horizontal thrust of cam surface 61 against plug 62 so that it moves horizontally to the right under the supply pressure and into chamber 55. This unseating of plug 62 permits flow of the supply liquid around O ring 63 into supply chamber 55. By this action the chamber is refilled when liquid is discharged; and, as it is refilled the float 56 again rises. The rising of the float 56, simultaneously raises upwardly the link arm 59 which again cams shut plug 62 to again shut off the supply of liquid into chamber 55. In a normal rapid filling operation the actual effect of this constant filling and discharging of chamber 55 is more accurately defined as an oscillating of the plug 62 as well as of the liquid level 57.

In a normal packaging operation then liquid flows substantially continuously from supply (not shown) through lines 51, 52, 54 into the filling chamber 55 to provide virtually constant liquid level. Liquid, in like manner flows out of the chamber 55 via line 64, valve 65, line 66 and through fill tube 44. A line 53 and three-way valve 65 is provided so that the system can be purged of air as prior to start-up. The precise manner in which the proper quantum of liquid is metered to the tubular blank through fill tube 44 is by the timed action of cylinder-piston unit 31, and this is best shown by specific reference to FIGURES 1 and 6.

In response to a timed signal cylinder-piston unit 31 is activated and piston rod 36 is thrust outwardly so that its shank 37 pushes against projection 38 mounted on the enlarged portion 39 of shaft 40, causing rotation of said shaft 40. Rotation of shaft 40 causes a corresponding rotation of lever arm 41 which pulls on link 42 causing also a corresponding rotation of arm 43 since the latter arm members are connected via linking member 42. Referring to FIGURE 6 specifically, it will be readily seen that this action on arm 43 rotates fill tube 44 which is pivotally connected to line 66, and the action also rotates perforated valve disc 45 keyed thereto by projection of its cam surface 47 into notch 46 of fill tube 44. This aligns the openings of said valve disc 45 and those of the rigidly fixed discharge nozzle 48 within which valve disc 47 is projected and pivotally fitted. Because beveled nozzle 48 is fitted into and keyed with the fixed cylindrical member 49 via the lands 67, 68 and mating groove 69 (and another not shown) it does not rotate and liquid flows through fill tube 44. Liquid flows from chamber 55 as long as the valved fill tube 44 remains open. As the opening of valve disc 45 and nozzle 48 move out of alignment on continued projection of piston rod 36 the flow of liquid ceases. Upon withdrawal of cylinder-piston rod 36 into cylinder-piston unit 31 the projection 38 is rotated in the opposite direction and with it arm 43 so as to again align and then unalign the openings within the valve disc 45 and discharge nozzle 48 one with the other, this again initiating and then cutting off the flow of liquid through fill tube 44.

All of the hydraulic cylinder-piston units referred to, to be described later in detail with reference to the timing cycle, are actuated by hydraulic system 80 which is operatively associated with each of said units through suitable directional flow valves 34, 76, 134, 145, 146, 197, 267, 271, through lines 96, 97, 98 to manifold 100 and line 94, respectively.

Directional flow valves suitable for the practice of this invention are known to the art, a preferred type of four-way valve known to the trade as a spool valve. A schematic representation of such valve is illustrated in FIGURES 9 and 10. In each of the figures is shown a spool 186 containing two pairs of openings 187_1, 187_2 and 188_1, 188_2. The spool is slidable to the right or to the left within the confines of the cylindrical body 189 in accordance with a push or pull upon the projections 190, 191. It will be apparent that either or both these projections 190, 191 can constitute the core of a solenoid (not shown) and be actuated by an electrical signal. Thus, a solenoid might be used at either end of cylindrical body 189 and spring loaded at the other so that when the solenoid is no longer activated the spool will be returned to an original position. Such valves can obviously be activated by other methods, or even by hand.

It will also be observed that when one pair of the openings 188_1, 188_2 is closed to inlets 192, 194 and outlets 193, 195 the other pair of openings 187_1, 187_2 is open thereto and that a shift in the alignment of these openings will reverse the direction of fluid flow.

In FIGURE 9 then where the spool 186 is to the extreme right liquid is free to flow upwardly through line 192, through opening 187_1 of the valve and into line 194. Simultaneously, liquid flows in the reverse direction through line 195, through the valve opening 187_2 and into the line 193. The direction of fluid flow, however, is exactly the reverse in lines 194, 195 when spool 186 is

shifted to the extreme left position as in FIGURE 10. In this figure the flow of fluids is from line **192** through conduit 188_2 and into line **195**. On the other hand, the flow of liquid from line **194** is through valve opening 188_1 and to line **193**. The action of the two and three-way directional flow valves also used herein are quite common and shall not be described in specific detail.

The hydraulic system **80** shown by refrence to FIGURE 1 is constituted of a suitable sized pump **84**, driven by motor **82**. The pump **84** is provided with a supply of hydraulic fluid **91** from reservoir **92**. Thus, pump **84** withdraws oil via its suction line **81** and discharges same via its discharge line **85** through lines **95**, **96**, **97**, **98** to manifold **100** and to line **94**, respectively. A safety device is provided at the discharge side of pump **84** consisting of a two-way relief valve **88** which connects to the discharge side of the pump via line **86** and with the reservoir **91** by connection through line **87**. Any type of pump **82**—i.e. gear, vane, piston, or the like—can be employed and motor means **82** can be electrical, steam, pneumatic or the like.

Preferably the hydraulic system includes also an accumulator device **89** operatively connected to the discharge side of pump by a suitable line **90** leading into line **85**. Such device can be any of several known types. For example, it can be a gas filled bag in contact with the pressurized hydraulic fluid so that the former can deflate upon increase of hydraulic pressure and which, correspondingly, can inflate upon decreased pressure so as to modulate the pressure supplied by the hydraulic system.

By reference to FIGURE 8 will be described an overall operating cycle from an interval of time wherein carriage **150** is at the bottom of its stroke, a liquid filled carton has just been ejected and web **10** lies motionless. The light beam transmitted by the photoelectric eye **20** at this time falls upon indicia on the web **10** and the beam is reflected back to the detector portion of the photoelectric eye **20**.

Referring to the figure is shown two different groups of Microswitches **240**, **260**. Each of the Microswitches of the group is in electrical contact, when closed and a respective circuit completed, with a solenoid actuated directional flow valve so that actuation of the respective circuit opens or reverses the flow of hydraulic fluid to the respective hydraulic cylinder-piston unit providing an operating function of the machine. The individual Microswitches are closed in timed sequence to provide the desired apparatus function, many of which occur simultaneously or in predetermined sequence. Thus, Microswitch groups **240** and **260** are closed in predetermined sequence by a series of rotating discs, mounted upon shafts **256**, **266** rotated by motor means not shown. Each disc is provided with a cam surface (not shown) to affect closure of an adjacent Microswitch. Obviously, a number of independently mounted discs or groups of discs can be utilized to define any machine function at a preselected time. Also, discs can be employed each rotating at different speeds driven by single motor means, but wherein the different series of discs are mounted on different shafts geared together at desired gear-ratios. In the presently described apparatus, in fact, Microswitch group **260** is acted upon by a series of camming discs of similar diameter revolving at one-half the speed of those which act upon Microswitch group **240**.

In initially describing a cycle it shall be assumed that the switch **292** within the photoelectric scanning circuit therefore remains open during the following first cycle of operation so that no correction is applied to the registration correction cylinder **170**.

In operation, the following sequences of operations occur:

An upstroke of carriage **150** is initiated: Microswitch **246** is cammed shut by rotation of disc **245** to energize the four-way solenoid valve **146** via energization of circuit **281** shifting the spool of the valve to initiate flow of pressurized hydraulic fluid via line **148** into the bottom of the cylinder-piston unit **160** and causing flow outwardly from the cylinder-piston unit via flow through line **147**. Piston rod **158** is thus projected outwardly and carriage **150** begins its ascent.

Rotation of jaws **110**, **120** is initiated simultaneously; Microswitch **261** is cammed shut by rotating disc **259** and double acting solenoid four-way valve **145** activated via energization of circuit **291** to cause flow of pressurized hydraulic fluid via line **144** into hydraulic cylinder-piston unit **136** this causing projection of piston rod **137** so that the rotatable member **140** begins to revolve as the carriage **150** moves upward.

While carriage **150** moves upward the punch mechanism **200**, tape advancing mechanism **210**, tab cutting mechanism **230** and longitudinal seal unit **270** go through an entire cycle of operation. On initiation of the upstroke holes **9** are punched and tapes **214**, **215** are simultaneously advanced by activation of cylinder-piston units **219**, **250**. Simultaneous activation of cylinder-piston unit **71** produces a longitudinal seam while activation of cylinder-piston unit **270** activates knife **212** of the tab cutting mechanism **230**. Prior to the carriage **150** reaching the peak of the upstroke, however, the reverse function of each of these operations also occurs. The punch member **203** of the punch mechanism **200** is withdrawn and simultaneously the tape advancing mechanism **210** is repositioned. The longitudinal seal member **73** of cylinder piston unit **70** is withdrawn and activation of cylinder-piston unit **270** causes retraction of knife **212**.

Simultaneously with initiation of the upstroke then punch assembly **200** is activated to punch holes and the tab advancing mechanism advances the tapes: solenoid valve **267** is activated by the camming shut of Microswitch **263** by action of disc **262** this causing activation of circuit **283** to reverse the flow of fluid through cylinder-piston unit **250**. Thus, fluid flows into cylindrical piston unit **250** via line **269** causing extension of piston rod **204** which moves the punch plate **203** upwardly into dies **201**, **202** through web **10**. Concurrently, fluid flows via line **269** the upper end of cylinder-piston unit **219** causing extension of piston **221** which via action upon clutch **224** activates tape advancing mechanism **210** to advance the tapes.

Simultaneously, and alternately with the punch-tape advance function, a tab seal unit **19** (FIGURE 1) is completed: Rotating disc **264** cams closed Microswitch **265** activating solenoid valve **271** via energization of circuit **284** causing activation of cylinder-piston unit **270** by flow of hydraulic fluid via line **272** into the lower end of the unit to project piston rod **234** which carries knife blade **212** upwardly to sever the tabs and to apply the face of heat sealing member **213** against the tabs and back-up plate **211** to form straw seals **19**. Unit then also retracts before peak of upstroke.

Simultaneously, a longitudinal sealing of the tube is completed by action of cylinder piston unit assembly **70**: Microswitch **248** is cammed shut by rotation of disc **247** to activate through circuit **285** the four-way solenoid valve **76** causing flow of hydraulic fluid into cylinder-piston unit **71** via line **74** causing projection of the piston **72** which applies member **73** against the web **10** to heat seal together the longitudinal edges.

Near the peak of the upstroke punch assembly **200** and tape advancing mechanism **210** is repositioned via action upon one-way clutch **220**: solenoid valve **267** is again activated by the opening of Microswitch **263** and de-energizing of circuit **283** so that the spool is shifted to reverse the flow of pressurized hydraulic fluid. Fluid thus flows into cylinder-piston unit **250** via line **268** which retracts piston rod **204** and, simultaneously, withdraws piston rod **221** of cylinder-piston unit **219** so that the latter through action of one-way clutch assembly **224** is repositioned.

The tab seal member **213** simultaneously is withdrawn: current ceases to flow in circuit **284** because the camming action of disc **264** upon Microswitch ceases and Microswitch **265** permitted to open. When this happens the spool of the spring loaded solenoid valve **271** shifts and causes reversal of fluid flow into the cylinder **270** via line **273** and outwardly through line **272** so that piston **273** is withdrawn, this in turn withdrawing tab seal member **213**.

Simultaneously, the longitudinal sealing member **73** is withdrawn: current ceases to flow in circuit **285** by virtue of the opening of Microswitch **248** the camming action thereupon of disc **247** having ceased. This action causes a shifting of the spool of the spring loaded solenoid valve **76** to reverse the flow of hydraulic fluid to piston unit **71** via line **75** to produce a withdrawal of longitudinal sealing member **73**.

At the peak of the upstroke rotatable member **140** and consequently jaws **110, 120** having completed a full 90 degree rotation, disc **249** cams shut Microswitch **251** to energize circuit **287**, this triggering four-way solenoid valve **134** causing flow of hydraulic fluid into the cylinder-piston units **122, 123, 124** causing projection of rod **121** and withdrawal of rods **103, 104** to affect closure of jaws **110, 120** upon the tube transversely sealing and severing the package from the tube.

The upward movement of carriage **150** ends and the carriage begins its working stroke: current ceases to flow in circuit **281** as Microswitch **246** opens upon the ceasing of the camming action thereupon by disc **245**. The spool of spring loaded solenoid valve **146** then shifts and the direction of flow of hydraulic fluid to main cylinder **160** is reversed. The movement of carriage **150** is thus initiated and moved downwardly by flow of fluid into cylinder-piston unit **160** via line **147** outwardly via line **148**. This action draws the tube downwardly and web **10** is pulled through the machine.

The filling of the tubular blank is initiated and completed with each single projection or withdrawal of piston rod **36**. Thus, as fill tube **44** begins a rotation the openings of disc **45** and those of nozzle **48** are brought into alignment and flow of liquid through fill tube **44** is begun. As piston rod **36** continues the openings come into full alignment, one set of openings with the other, and then move out of alignment. Flow then diminishes and finally stops when the openings are no longer aligned.

All of the operating variables of the fill system are readily controllable. Thus, for a liquid of any given viscosity the fill tube and openings therein can be properly sized. Moreover, the desired time of delivery is readily provided by sizing lines **32, 33**, to cylinder-piston unit **31** so that the openings remain open for the desired interval. An adjustable dialing system can even be employed in lines **32, 33** if desired. Furthermore, a substantially constant pressure is provided upon the liquid.

A major advantage of this liquid free system is that an accurate metered quantity of liquid is provided to the blank and seal contamination is avoided. There is, in fact, even no contamination caused from splashing or blowing of liquid upon the seals because very low pressure is generally required to provide a rapid and smooth delivery of liquid or other fluent substance to the blank.

For most liquid the tubular blank is filled with the desired quantity of liquid long prior to completion of the carriage downstroke. If desired, however, the entire carriage cycle from initial closing of jaws **110, 120** can be used to affect filling of the tubular blank.

Upon arrival of carriage **150** at the bottom of its working stroke the grasp of jaws **110, 120** upon the tube and the sealed liquid filled package is released. This happens when solenoid valve **34** and its circuit **287** is de-energized by the opening of Microswitch **251** by the ceasing of the camming action by disc **249**.

At the bottom of the downstroke rotation of platform **130** and consequently jaws **110, 120** are initiated.

While carriage **150** dwells at the bottom of its downstroke disc **241** cams shut Microswitch **242** energizing circuit **289** this in turn pulsing circuit **282**, through connection with Microswitch **261**, this shifting the spool of solenoid valve **145** causing flow of hydraulic fluid into cylinder piston unit **136** via line **143** causing withdrawal of piston rod **137** to produce rotation of member **140**. It is noted that Microswitch **242** is closed every single machine cycle and that Microswitch **261** directs the pulse alternately to either side of solenoid valve **145**. This then results in a single projection or withdrawal of piston rod **137** for each cycle. The foregoing cycle is then repeated ad infinitum.

The web punch assembly **200** and tab forming and advancing mechanism **210** and severing mechanism **230**, it is again noted, are activated only during alternate cycles—i.e. only once for every two cycles of all other operations. Hence, the group of Microswitches **250** are activated by a series of cammed discs mounted on shaft **266** which rotate at only one-half the speed of those discs of similar diameter mounted on shaft **266** which activate Microswitch group **240**. Obviously, however, this ratio is selected only because two straw seals **19** are formed simultaneously and hence provide straw seal units for two packages.

A feature of this invention is that a correction is periodically applied to assure a proper predetermined package length. In an operation wherein packages were continuously formed and no effort made to closely control package length the lengths of the different package would be quite variable and would make centering of written descriptions, trademarks, brandnames and the like normally appearing on a package difficult or impossible. To provide such web registration and control a photoelectric control system shall now be defined which applies periodic corrections to the length of the carriage stroke.

The stroke of the carriage **150** is deliberately set to slightly overtravel the desired package length e.g. by a few thousandths of an inch. The overtravel thus causes all package lengths to be slightly longer than the preselected optimum and there is no drift to a package of length shorter than this optimum. Over a plurality of cycles, however, there is an accumulation of overfeeds and the light projected from photoelectric eye **20** senses a change in the positioning of web **10** when it is scanned at a preselected time. When this happens the light is e.g. transmitted, diffracted or otherwise changed so that the intensity of the refleced beam is altered. Sensing such change a correction is applied upon the registration control cylinder **170** to project a piston **165** into the path of the piston **159** to shorten the carriage stroke. This then brings the web **10** back into registration.

While proper package length is being maintained within the desired ranges the light signal or beam from the photoelectric cell **20** (circuitory not shown) impinges upon the web **10** and does not "see" an indicia mark at a preselected time when web **10** lies motionless. Because of the overtravel, however, the mark eventually is aligned with the beam and a different portion of the light is reflected back to the receiver (not shown) of the photoelectric cell **20** when the scanning takes place. When this condition occurs the switch **292** within the relay control box **290** closes to complete a circuit which is open or closed depending on whether or not Microswitch **255** is open or closed. When Microswitch **255** is cammed closed during the carriage upstroke by action thereupon of disc **254** circuit **293** is activated and the spool of solenoid valve **197** is shifted and line **196** opened to permit flow of hydraulic fluid into the bottom of registration correction cylinder **170** causing projection of vertical cylinder **165** upwardly into cylinder barrel **178** to a predetermined extent, which is some small multiple of the distance of overtravel. Thus, the face **178** of the vertical cylinder **165** is projected into barrel **055** to shorten the effective length of the stroke of cylinder piston rod **158** on the next

succeeding downstroke by shortening its downward movement by a predetermined amount. After the shortened downstroke has been affected switch **253** is cammed closed to pulse the opposite side of solenoid valve **197** to open hydraulic line **196** to sump. The pulsing of this return solenoid on valve **197** is made every machine cycle at this point irrespective of whether a shortened stroke or correction has been made on the previous downstroke. The correction is applied for additional cycles of the machine, as necessary, until the eye **20** no longer registers upon the indicia. When correction no longer becomes necessary, solenoid valve **197** again pulses line **196** to sump, and when carriage **150** begins its downstroke and piston **159** contacts face **178** of vertical drive cylinder **165** the piston **158** forces the vertical cylinder **165** back into its unextended position.

Having described the invention, that which is claimed is:

1. In a machine for forming liquid filled packages from a supplied liquid and a continuous flat flexible web wherein is included

means for guiding the flat flexible web along a path, a forming mandrel for shaping the web in tubular form while advancing same downwardly along the longitudinal axis of the mandrel,

means for longitudinally sealing together the edges of the web to form a tube,

a vertically reciprocable carriage carrying a pair of clamping jaws for grasping and moving said web on the downward movement of the carriage and for forming a completed liquid filled package and tubular blank upon closure of the jaws on the tube in transversely sealing,

the improved liquid supply and metering apparatus comprising in combination:

a liquid level control chamber having float valve mechanism for throttling liquid from supply into the chamber to provide a substantially constant level of liquid at constant pressure to a valved fill tube connected therewith which tube extends downwardly into the tubular blank,

said fill tube being provided with openings and being rotationally fitted within a fixed nozzle opening so that rotational movement of said fill tube about its longitudinally axis aligns the openings, and on continued rotational movement in the same direction moves the openings out of alignment,

a metering system including a fluid actuated cylinder-piston unit, the piston of which is pivotally affixed through its rod to linking means for producing rotational movement of the fill tube of the liquid supply mechanism about its longitudinal axis to align the openings of the fill tube and outlet nozzle,

said cylinder-piston unit being operatively associated with a directional flow valve for initiating and reversing fluid therethrough for reciprocation of the piston to open and close the valved fill tube in timed sequence with other machine functions whereby a measured portion of liquid is provided to the tubular blank for forming a package.

2. The apparatus of claim **1** wherein the fluid actuated cylinder-piston unit of the metering system is operatively connected to a solenoid actuated directional flow valve, said solenoid constituting a portion of an electrical circuit which includes a Microswitch which can be opened and closed by an automatic timing device to energize and de-energize the electrical circuit to open and close the directional flow valve in timed sequence to provide an actuating fluid to the cylinder-piston unit for piston reciprocation and metering of portions of liquid from the chamber into the tubular blank for packaging.

3. The apparatus of claim **1** wherein the piston of the cylinder-piston unit is pivotally connected via its rod to the arm of a shaft for producing rotational motion thereof about its longitudinal axis, and wherein the shaft is linked to the fill tube via an arm thereto which provides a corresponding rotational motion of said tube to meter portions of liquid to the tubular blank by providing timed alignment of the fill tube and nozzle openings.

4. The apparatus of claim **1** wherein the liquid supply chamber is provided with a float valve mechanism which is linked to a pivotally connected lever arm provided with a camming surface opposite the pivotal connection, which acts against a plug located within a supply port, the raising and lowering of which lever in response to the rise and fall of the liquid level within the chamber actuates and closes the port by thrust against the plug on rise of the liquid level and opens the port by movement of the camming surface away from the plug on the fall of the liquid level to open and close the chamber to supply.

5. In a machine for forming liquid filled packages from a supplied liquid and a continuous flat flexible web wherein is included

means for guiding the flat flexible web along a path, a forming mandrel for shaping the web in tubular form while advancing same along the axis of the mandrel,

means for sealing together the edges of the web to form a tube,

a carriage carrying a pair of clamping jaws for grasping and moving said web on movement of the carriage and for forming a completed liquid filled package and tubular blank upon closure of the jaws on the tube in transversely sealing,

the improved liquid supply and metering apparatus comprising in combination:

a liquid level control chamber having float valve mechanism for throttling liquid from supply into the chamber to provide a substantially constant level of liquid at constant pressure to a valved fill tube connected therewith which tube extends into the tubular blank,

said fill tube being provided with openings and being rotationally fitted within a fixed nozzle opening so that rotational movement of said fill tube about its axis aligns the openings and on continued rotational movement in the same direction moves the openings out of alignment,

a metering system including a fluid actuated cylinder-piston unit, the piston of which is pivotally affixed through its rod to linking means for producing rotational movement of the fill tube of the liquid supply mechanism about its axis to align the openings of the fill tube and outlet nozzle,

said cylinder-piston unit being operatively associated with a directional flow valve for initiating and reversing fluid therethrough for reciprocation of the piston to open and close the valved fill tube in timed sequence with other machine functions whereby a measured portion of liquid is provided to the tubular blank for forming a package.

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